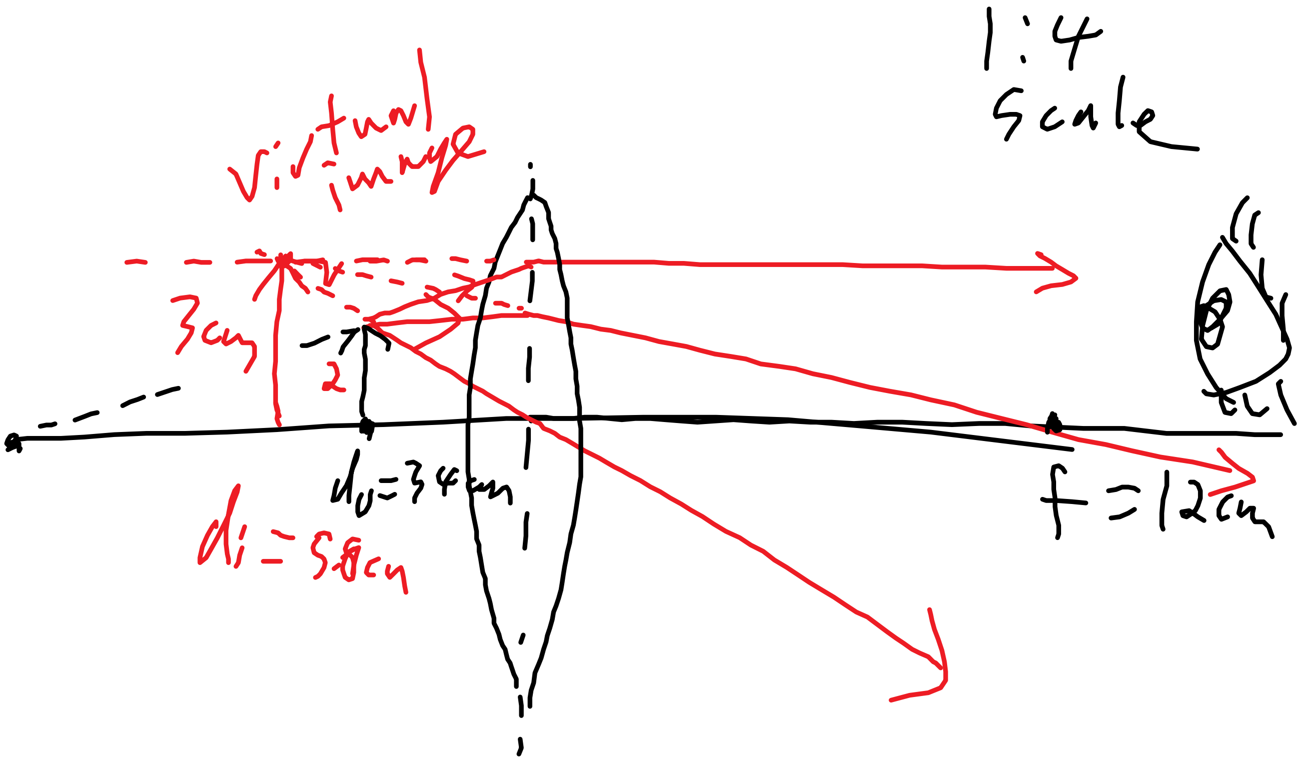
Quiz next class
Curved mirrors and lenses (ch 18)

P383 Q18



$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \qquad \frac{1}{12\text{cm}} = \frac{1}{3.4\text{cm}} + \frac{1}{d_i}$$

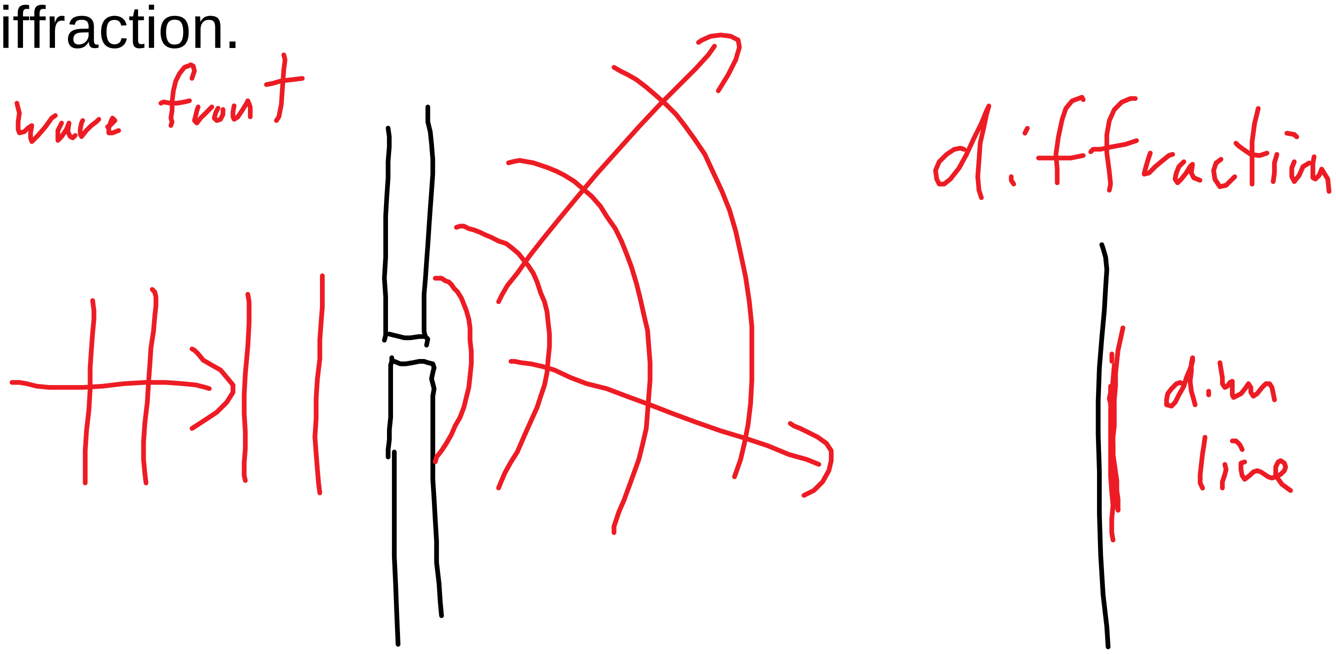
$$d_i = \boxed{-4.74\text{cm}}$$

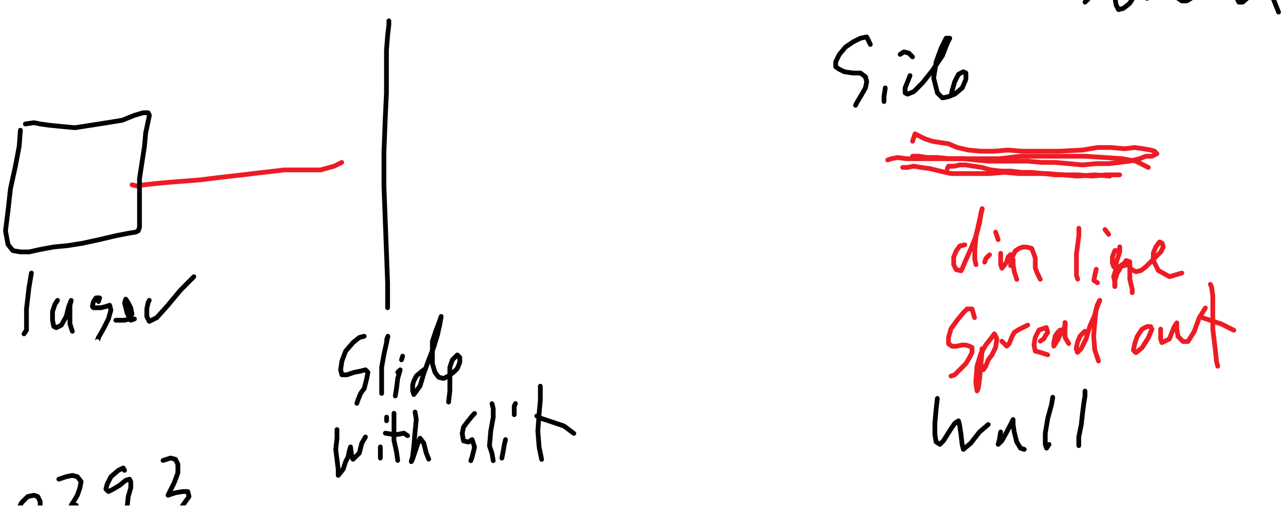
$$m = \frac{-d_i}{d_o} = \frac{-(-4.74\text{cm})}{3.4\text{cm}} = 1.39X$$

$$h_1 = m h_0 = 1.39(2.0\,cm)$$
$$= \boxed{2.8\,cm}$$

Chapter 19
Diffraction and Interference

When waves go through a single narrow opening, a slit, the waves spread out by diffraction.

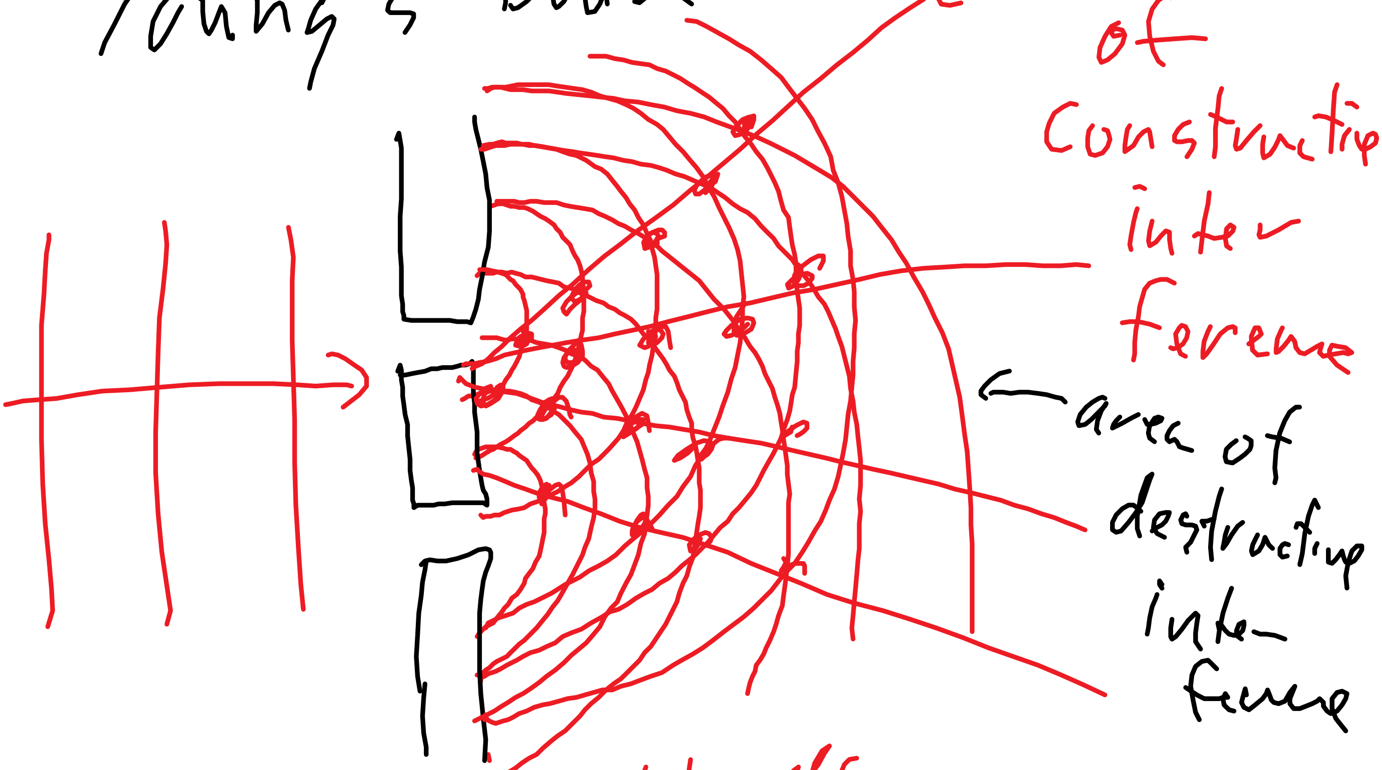


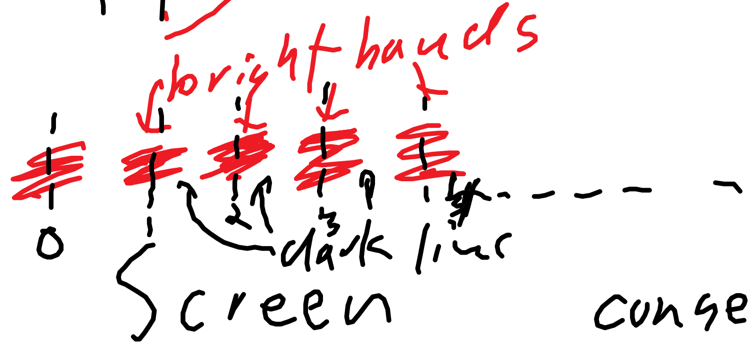


with slit   wall

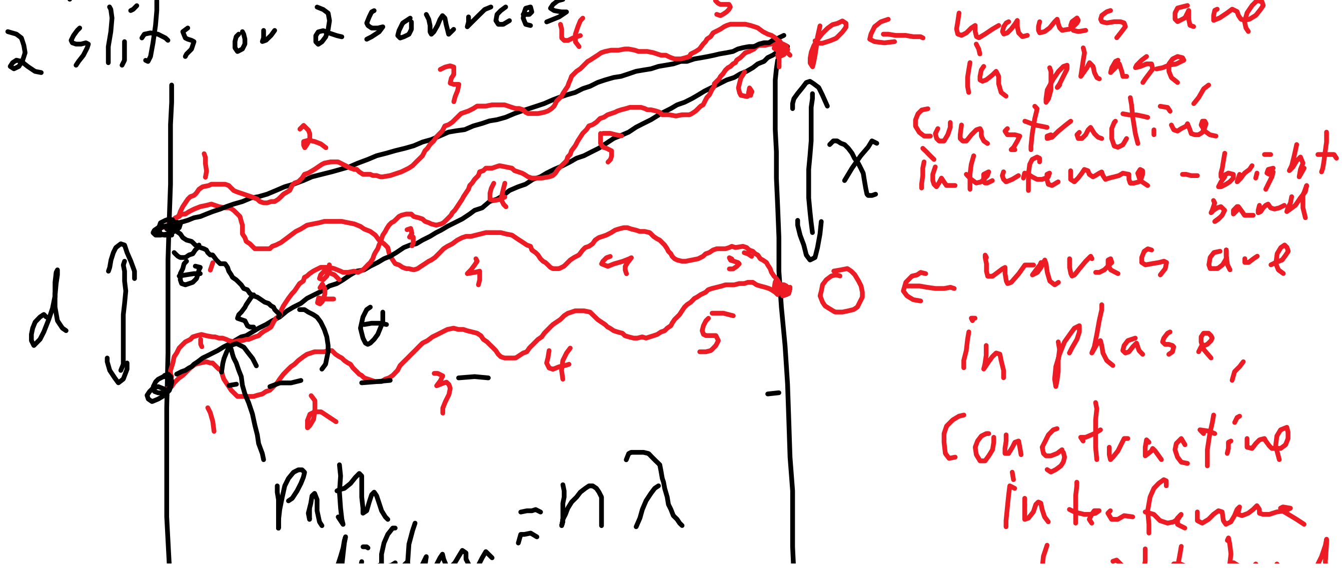
p293

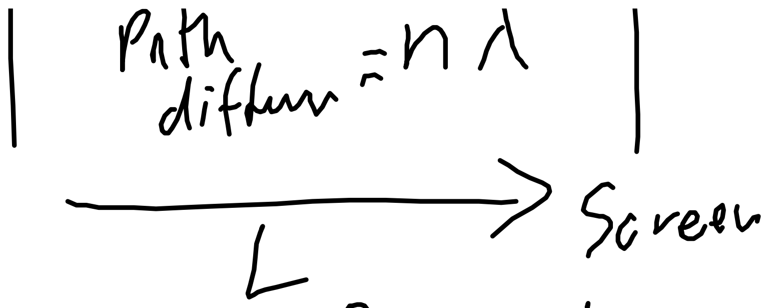
Young's Double Slit





n is number of consecutive bright bands





interference - bright band

$$\sin\theta = \frac{n\lambda}{d} \approx \tan\theta = \frac{x}{L}$$

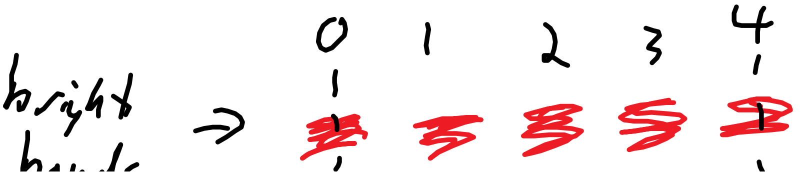
($\approx$: approximately equal to)

for small θ: $\frac{n}{d}\lambda = \frac{x}{L}$

n is the number of consecutive bright bands (start from 0)
d is the distance between the slits or sources.
x is the distance between the centre of the bright bands.
L is the distance to the screen from the slits/sources.
λ is the wavelength.

Eg. A helium-neon laser emits monochromatic light (one wavelength) of wavelength 632.8 nm.

When I shine it through 2 slits, I see the following pattern on the screen 6.0 m away:



20.0cm

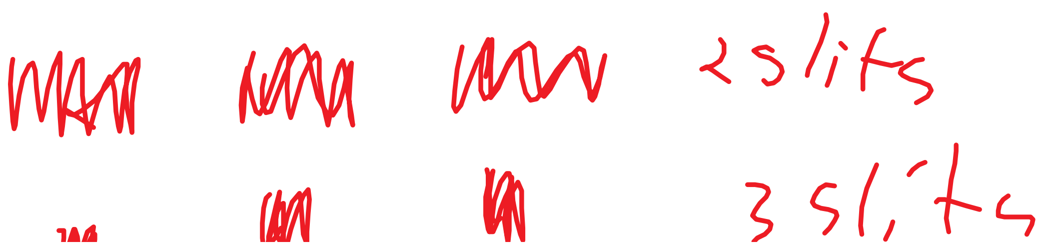
a) What is n for the set of bright bands?
b) What is the distance between the slits?
c) If the distance between the slits was half, describe the change in the pattern on the screen.
d) If we had 3 slits instead of 2, how does the pattern change?

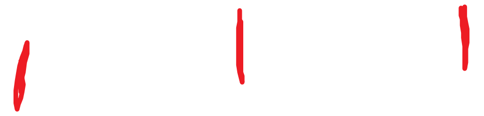
a) n= 4
b) $n\lambda/d=x/L$

$D = n\lambda L/x = 4 (632.8nm)(6.0m)/20.0cm$

$= 4x632.8x6/0.2=75,936\ nm$
0.076mm apart

c) Twice as wide
d) Same but smaller bands



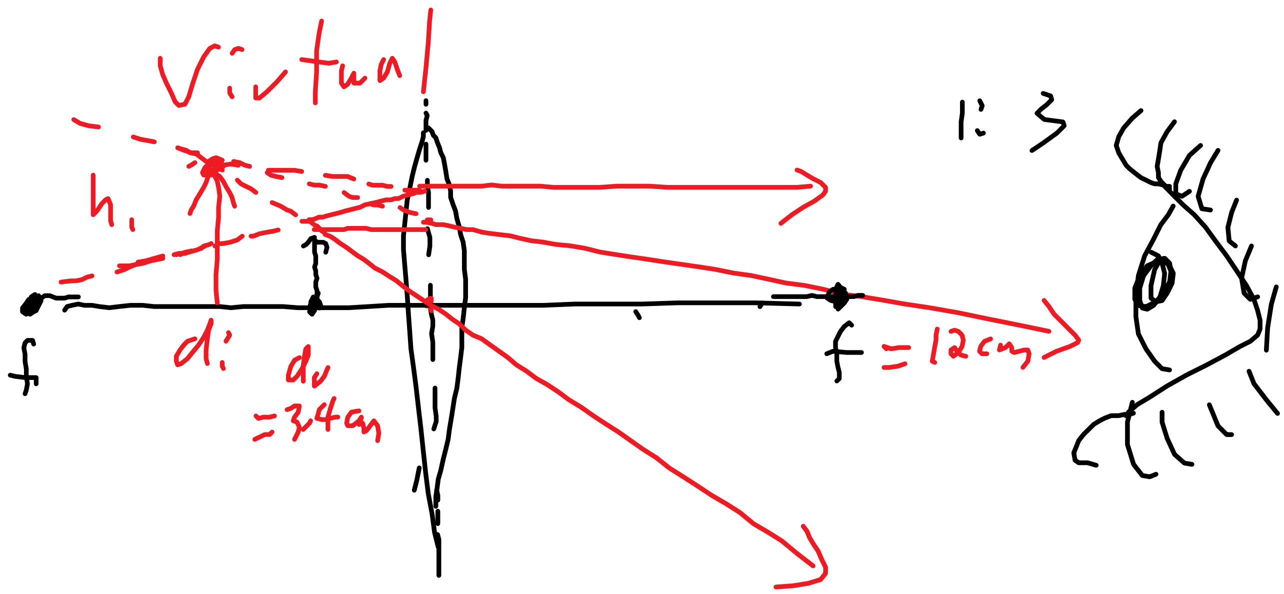


multy slits
-diffraction gating

P383 Q18

f=12cm do = 3.4cm ho = 2.0cm

Find di, hi, m, type of image



$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{12cm} = \frac{1}{3.4cm} + \frac{1}{d_i} \qquad d_i =$$

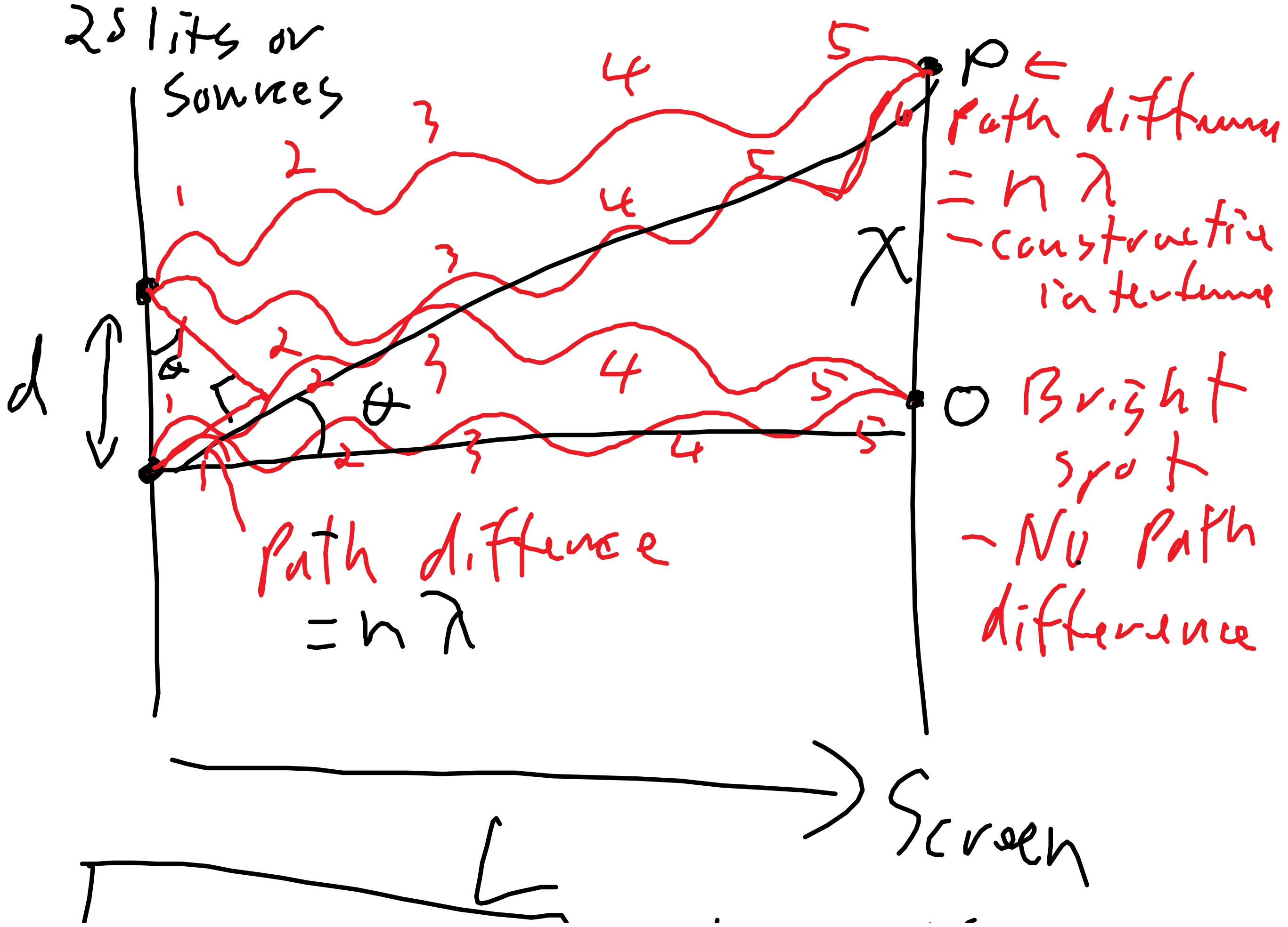
$$0.08333 - 0.2941 = -0.21078 = \frac{1}{d_i}$$

$$d_i = -4.74\text{ cm}$$

virtual

$$m = \frac{-d_i}{d_o} = \frac{-(-4.74)}{3.4} = 1.39X$$

$$h_i = m\,h_o = 1.39 \times 2 = 2.8\text{ cm}$$



L screen

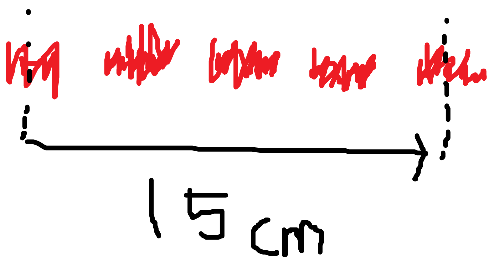
$$\sin\theta = \frac{n\lambda}{d} \approx \tan\theta = \frac{x}{L}$$

for small θ

$$\frac{n\lambda}{d} = \frac{x}{L}$$

θ is the angle between the centre of bright bands.
n is the number of bright bands (start counting at 0)
λ is the wavelength
d is the distance between the slits or sources.
x is the distance between bright bands
L is the distance to the screen.

Eg. A helium-neon laser produces monochromatic (one wavelength) light with wavelength 632.8nm. If you shine the laser through 2 slits, you observe the following on the screen 6.0 m away:



a) What is n for the 15 cm distance?
b) What is the distance between the slits?

c) If the distance between the slits was halved, how does the pattern on the screen change?

d) If there are 3 slits with the same distance apart, how does the pattern change?